DOCUMENT RESUME

ED 212 467 SE 036 076

TITLE Sex-Role Stereotyping in Mathematics Textbooks. Research Report.
INSTITUTION New Zealand Dept. of Education, Wellington.
PUB DATE Mar 80
NOTE 12p.; Not available in paper copy due to marginal legibility of original document.

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Educational Research; Elementary Secondary Education; Foreign Countries; *Mathematics Curriculum; *Mathematics Education; Mathematics Instruction; Mathematics Materials; *Sex Role; *Sex Stereotypes; *Textbook Bias
IDENTIFIERS *Mathematics Education Research; New Zealand

ABSTRACT

This study looked at six primary textbooks and 25 of 31 secondary textbooks of mathematics published in New Zealand. All exercises, problems, and illustrations were analyzed for references to roles and activities assigned to males and females. The number of times males and females were mentioned and the number of famous people of each sex noted were recorded. Language used was analyzed for examples of sexism. Results indicated four times as many roles were assigned to males as to females. Roles commonly given for females included teacher, mother, student, sister, nurse, girl guide, secretary, shop keeper, and housewife. These nine roles accounted for 59% of female roles in primary textbooks and 40% of those in secondary. The proportion of males to females taking part in activities was similar in primary texts but males appeared in the majority of activities in secondary texts. Illustrations were fairly well balanced in primary texts but secondary texts favored males. The use of "he" and "man" are cited as examples of textbook bias. Given this and other data, it was concluded that the textbooks as a group give strong evidence of bias in favor of males. (MP)

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SEX-ROLE STEREOTYPING

IN MATHEMATICS TEXTBOOKS

MARCH 1980

SEX-ROLE STEREOTYPING IN MATHEMATICS TEXTBOOKS

1 Introduction:

Children's developing attitudes about themselves and about what is expected of their sex are influenced by innumerable factors. The textbooks they use, by bearing the official approval of teachers and the school, may carry a good deal of weight in forming children's attitudes, including their opinions of the roles appropriate to each sex.

As part of a study into school textbooks for examples of sex-role stereotyping, it was felt that an examination of mathematics texts was needed for two major reasons. Firstly, even in a book designed to teach a subject as neutral as mathematics, there may be subtle influences at work on the child's social attitudes and behaviour. Secondly, since mathematics is already often seen as a male domain, with proportionately fewer females studying mathematics as they progress through secondary school, it is important to find out whether mathematics textbooks reinforce this preconception.

For equal opportunity of education to be fully operative, textbooks must not seem to be directed to one sex rather than the other. Were it to be seen to address itself to a male reader, or to display a preponderance of males in its exercises and illustrations, a maths textbook could leave the student with the reinforced impression that mathematics is a masculine world. This may work subconsciously, but is yet another pressure (along with attitudes of peers, parents, teachers and the media), which may guide girls out of the maths field.

The analysis focused on the following questions:

1. What roles and occupations are mentioned for males and females?
2. What activities are described in connection with males and females?
3. Overall, how many other times are males and females mentioned?
4. How many famous people of each sex are mentioned?
5. Are there any examples of sexism in the language used?
6. Are any unusual, non-stereotyped roles mentioned?

Answers were also sought for the more general questions: Are maths books aimed at girls as well as boys? Are girls perceived as maths students equally with boys? What view do the textbooks give of the place of women in the world?

2 Methodology:

A list of mathematics textbooks published in New Zealand was obtained from Development Division. The six primary textbooks and 25 of the 31 secondary textbooks were examined to check for the presence of sex-role stereotyping. All exercises, problems and illustrations were analysed for references to roles and activities assigned to males and females. The number of times males and females were mentioned and the number of famous people of each sex were also recorded. The language used was analysed to see whether there were any examples of sexism.

3 Results:

3.1 Roles:

Table 1 - Roles Described for Males and Females

	Primary Textbooks		Secondary Textbooks	
	Number	%	Number	%
Males	62	78	235	80
Females	17	22	57	20
Total	79	100	292	100

Four times as many roles were assigned to males as to females. While the male roles covered a wide range from aircraft technician and algebraist to window cleaner and yachtsman, the female roles were far more limited and included some very stereotyped roles, eg, nurse and secretary. The list of roles can be obtained from the Research and Statistics Division.

Roles commonly given for females were: Teacher (17), mother (9), student (7), sister (4) and nurse, girl guide, secretary, shopkeeper, housewife (3 each). These nine roles accounted for 59% of female roles in primary textbooks and 40% of those in secondary textbooks.

The roles most frequently given for males were: mathematician (63), shopkeeper/proprietor (22), salesman (18), farmer (15), surveyor (13), manufacturer (12), father, teacher, professor (11 each). These nine roles accounted for only 40% of male occupations in primary texts and 27% of those in secondary texts. It is disturbing to note that while many males were defined as "mathematicians" the one female with this role was called a "woman mathematician". A conclusion which could be drawn from the roles shown for each sex is that men lead more active lives than women and follow a wider range of jobs.

However, women were shown in some unusual occupations in secondary school texts such as dealer, engineering cadet, gambler, philosopher, scientist and surveyor. This appears to be a start towards recognition that females occupy places alongside males in many areas of the workforce.

3.2 Activities:

Table 2 - Activities of Males and Females

	Primary Textbooks		Secondary Textbooks	
	Number	%	Number	%
Males	177	51	263	63
Females	168	49	153	37
Total	345	100	416	100

The proportion of males and females taking part in activities was similar in primary textbooks but differed in secondary texts where a majority of males appeared. The list of activities can be obtained from the Research and Statistics Division.

Both males and females were shown to be participating in many activities, eg, bicycling, buying clothes, camping, dancing, picking fruit and reading. Females were active in the sports area: Catching fish, climbing trees, driving a racing car and playing such traditionally male games as pool, marbles and tug of war. Females were described as investing money, working outside the home, running for election and earning more than their husbands. They owned and hired cars, pushed broken down cars, painted walls, asked boys out and owned a private plane.

Men were depicted in non-traditional roles as well - doing the family grocery shopping, cooking, making cakes, buying flowers and a vase and even showing fear in running from a bear and an alligator.

Thus it seems that some attempt has been made to show both men and women as involved in activities which transcend the fixed stereotypes.

However, many of the activities described do show women and men in stereotyped activities such as babysitting, baking, shopping, washing and sewing for women, and building a fence, boxing, chopping down a tree, driving a train and mowing a lawn for men.

3.3 Number of references to each sex

Another way of looking at the coverage given to females and males is to note the number of times each sex is mentioned apart from a connection with an occupation or activity. References to 'a man' or 'a woman' or names used were counted. Primary school textbooks showed a fairly even balance with 655 (53%) references to males and 578 (47%) to females. Secondary textbooks again showed a majority of references to males (62% of 2246 references).

3.4 Illustrations

Table 3 - Males and Females Shown in Illustrations

	Primary Textbooks		Secondary Textbooks	
	Number	%	Number	%
Males	393	55	247	80
Females	323	45	63	20
Total	716	100	310	100

As with the previous data, primary textbooks were fairly well balanced with respect to the numbers of each sex shown in illustrations but secondary textbooks again favour males.

Not only are females outnumbered by males but the illustrations also depict them almost universally in a strongly stereotyped manner. Females are nearly always shown wearing a dress; rarely are they in trousers or shorts. Women are often shown wearing an apron, while young girls usually have a bow or ribbon somewhere. Nor are males free from a stereotyped portrayal; boys are with rare exception dressed in casual clothes - jeans or shorts, t-shirt or casual shirt and sneakers - while men are usually shown wearing a hat.

By repeating these stereotyped portrayals the textbooks not only give an inaccurate picture of the world, but also confine the image of each of the sexes within narrow boundaries.

3.5 Language

Numerous examples of sexism in the language used in textbooks were encountered. The most common form was in the use of the male pronoun "he" applied to words which do not in themselves imply a specific sex, eg, a person, student or teacher, pupil, motorist, player, traveller, child, driver, passenger. "She" was used only in a few instances, referring to a student, person, runner and a missing child. This arbitrary use of "he" is all the more regrettable when used in the text to refer to the teacher or student of maths, thereby reinforcing the impression that maths books are directed to male students studying in a masculine field. Although this may have been done for grammatical reasons, it may be interpreted literally by children. Virtually all animals mentioned were given the male sex, eg, dogs, beetles, horses, tortoises, and hares. Only the elephant was a female.

Another instance of a bias in favour of males is the use of 'man' in the generic sense. The textbooks abounded with examples of this.

One further example of language to be mentioned is the large number of occupations mentioned which, due to their suffixes, appear to be reserved exclusively for males. Children would probably not think

of a woman as businessman, marksman, salesman, draughtsman, or postman. The impact of such names should not be shrugged off lightly; as Doris Gunderson[1] said in a paper presented at the 1972 meeting of the American Educational Research Association: "Children interpret language quite literally, and when they hear expressions such as chairman or brotherly love, they think of men (rather) than of the human race". Textbooks could do much to even out the ingrained biases of our language by offering examples of business women or showing pictures of women delivering mail.

3.6 Famous People

Table 4 - Famous People - Males and Females Mentioned

	Primary Textbooks		Secondary Textbooks	
	Number	%	Number	%
Males	49	94	155	94
Females	3	6	10	6
Total	52	100	165	100

The number of references to different famous people were recorded. The relative omission of women shown in Table 4 is perhaps due to the apparent lack of any great female mathematicians prior to the eighteenth century. However, when famous people are included in exercises there is no reason why the achievements of women should be neglected.

The accomplishments of males mentioned cover almost every field of human endeavour, while the only women mentioned were Queen Elizabeth I, Queen Victoria, Catherine the Great, Agatha Christie, Jane Austen, Florence Nightingale, Alice in Wonderland, Madame Arithmetic, Maria Agnesi (a mathematician), Amalie Noether and Marion Melhuish.
It would be extremely easy for the writers of textbooks to include examples which would teach children that there have been famous women as well as men in many fields, eg, "Madame Curie, the discoverer of uranium, was 67 years old when she died in 1934. When was she born?"[2]

In such a way, the exercises could be used to teach not only mathematics skills, but also to heighten students' awareness of women's roles in their historical and social contexts.

3.7 Trends Over the Years

It was of interest to discover whether there had been an improvement in the textbooks' portrayal of women over the last ten years. Three books were used in this comparison, all of them written for the Form 3 to 4 class level. Volume 1 of the "Pilot Mathematics" series and Book 1 of the "Shape of Mathematics" series were chosen as two texts currently in use which were published a decade ago (1968 and 1969 respectively), and were compared with the most

1 O'Donnell, H S. Sexism in Language, Elementary English, Vol 50, No 7, Oct, 1973.

recent book, "It's a Mathematical World" published in 1979. Of course, the number of books used in the comparison is very small and those chosen may not be representative of mathematics textbooks published overseas in the same years. While the second volume of the Pilot series would have seemed the logical book to compare with the 1979 text, as it was published exactly ten years earlier and is also designed for the Form 4 level, it was so heavily male oriented, with not a single female mentioned, that it did not seem representative of the general trend of the textbooks.

Table 5 - Comparison of Males and Females 1968-69 and 1979 (%)

	Roles		Activities	
	1968	1979	1968	1979
Males	90%	79%	81%	65%
	10%	21%	19%	35%
Total	100%	100%	100%	100%
N	51	24	36	49

There has been an increase in the proportion of females shown from 1968 to 1979 but there is still considerable room for improvement.

Examining the specific occupations mentioned in the two texts, we find the earlier books visualise women only as sister, mother, duchess and a queen while men are given numerous interesting jobs including meteorologist, statistician, navigator and wool-buyer's representative. By 1979 women are seen in more diverse roles: as a gymnast, and as a spy (not as the stereotyped glamorous female spy but dressed as her male counterpart in trenchcoat and dark glasses). The female stereotypes are still present, however, with references to harem girls and a home knitter.

As far as activities are concerned the earlier books show women doing such unobtrusive things as 'liking maths', 'sitting an exam', and 'being in a class'. Boys lead much more active lives while men earn money and have heart trouble.

Ten years later, men are still as busy and apart from joining weightwatchers and making a flower bed, nowhere do they step outside "masculine" activities. Women are starting to take part in a wider range of activities - they use a calculator, play sport, earn and invest money. One woman is referred to as Ms Brown. However, they are still shown in stereotyped roles such as shopping for groceries while men take part in more exciting activities as well as being cast in stereotyped roles.

4 Conclusion:

Thus when the 31 textbooks are considered as a group, there is strong evidence of a bias in favour of males, particularly in the secondary textbooks. Women are both proportionately under-represented and confined to a narrow stereotyped range of occupations and activities. By showing only men performing some roles which in fact are performed by both men and women, textbooks may limit children's growth and understanding about people and the world around them and may help to restrict girls' career expectations. These textbooks tend to reinforce the stereotypes found elsewhere - they do little to widen children's image of women. However, it is good to note that there are now at least a few examples of both men and women being shown filling roles which reach beyond the confines of stereotypes.

Mathematics, it appears, is still regarded as a field predominantly for males. Textbooks contain far more males than females; the student is usually referred to as 'he', a 'mathematician' is always a man - a 'woman mathematician' would be described as such. Fennema and Sherman in a 1977 article provide evidence to support their hypothesis that "because mathematics is perceived as a male domain, females sometimes do not achieve as well and tend not to elect to study mathematics to the same degree as they would if it were seen as a neuter domain".[3]

Sex-role stereotyping in textbooks may discourage girls from studying mathematics with the result that their career options are restricted and that they may lack confidence to cope with mathematics in daily life.

Research and Statistics Division

March 1980

3 Fennema and Sherman "Sexual Stereotyping and Mathematics Learning" The Arithmetic Teacher, Vol 24, No 5, May 1977.

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Rogers, Margaret A, "A Different Look at Word Problems," The Mathematics Teacher, Vol 68, April 1975, p285-288.

Sparkes, Lesley, "Sex Roles in Mathematics Textbooks," Christchurch Teachers College Study.

MATHEMATICS TEXTBOOKS COMMONLY USED IN NEW ZEALAND SCHOOLS

1 PRIMARY SCHOOL:

School Mathematics, Book 1 (Department of Mathematics), Std 1
Modern School Mathematics, Duncan et al (Houghton Mifflin)
Book 2 (NZ version) Std 2 Book 3 (NZ version) Std 3
Book 4 (NZ version) Std 4 Book 6 Form 1
1978 Book 7 (NZ edition) Form 2

2 SECONDARY SCHOOL:

Mathematics: A Study in Pattern, Nightingale et al (Jacaranda)
1973 Book 1,Form 3; 1974 Book 2, Form 4; 1975 Book 3, Form 5.
Teachers editions to each.

Moving with Mathematics, Begg et al (Nexus Books)
1974 Books 1 and 2, Form 3; 1975 Books 3 and 4, Form 4; 1976 Books 5 and 6, Form 5.

Working With Mathematics, Begg et al (Nexus Books)
1975, Books 1 and 2, Form 5 terminating.

Advancing With Mathematics, Begg et al (Nexus Books)
1978, Books 1 and 2, Form 6.

Pilot Mathematics, Herron (Whitcoulls)
1968, Book 1, Form 3; 1969, Book 2, Form 4; 1970, Book 3, Form 5.

Shape of Mathematics, O'Neill Ed.(Reed)
1969, Book 1 (or 1A, 1B), Form 3 - 4; 1970, Book 2 (or 2A, 2B), Form 4 - 5; 1972, Book 3A, 3B, Form 6.

Progressive Mathematics, Sealy and Harris (Longman, Paul)
1971, Book 1, Form 3; 1972, Book 2, Form 4; 1973, Book 3, Form 5.

It's a Mathematical World, Ellwood et al (Longman, Paul)
1979, Book 2, Form 4.

Do-Way Mathematics, Loretz (Heinemann)
1972, Book 1/ booklets, low ability, Form 3.
Book 2/ booklets, low ability, Form 4.

December 1979.